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All persons interested in the botany of the Southern Appalachian Mountains are invited to join the club. Dues, including subscription to the Journal, are $3.00 per year. Single copies of *Castanea*, seventy-five cents.

Notes and short scientific papers relating to the botany of the region are welcomed and will be published to the extent that the size of the Journal allows.

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CASTANEA

The Journal
of the
Southern Appalachian Botanical Club

Volume 17 September, 1952 No. 3

The Ranges of some Plants of the Appalachian Shale Barrens[1]

EARL L. CORE

Among the most interesting plants of the mid-Appalachian region are the endemic species of the shale barrens. These have been treated by numerous investigators, including Steele*, Wherry† and Platt‡, but it beems desirable to bring together information relative to their ranges, from collected material in various herbaria. The following symbols are used to designate the institutions supplying the material examined:

G — Gray Herbarium (Harvard University)
M — Missouri Botanical Garden
NY — New York Botanical Garden
Ph — Philadelphia Academy of Natural Sciences
US — National Herbarium (Smithsonian Institution)
WVa — West Virginia University Herbarium

ALLIUM OXYPHILUM Wherry. Jour. Wash. Acad. Sci. 15: 370. 1925

WEST VIRGINIA — Monroe Co.: Lillydale, *E. T. Wherry*, Aug. 12, 1924 (US, type); *Earl L. Core*, July 25, 1945 (WVa); Red Sulphur Springs, *E. T. Wherry*, Aug. 12, 1924 (US). Greenbrier Co.: White Sulphur Springs, *K. K. Mackenzie*, Aug. 27, 1903 (NY); *Lee Sowden*, Aug. 7, 1939 (Ph).

VIRGINIA — Giles Co: Peters Mt., The Narrows, *E. T. Wherry*, Aug. 12, 1924 (US). Alleghany Co.: Covington, *Alexander, Everett & Pearson*, Aug. 28, 1933 (NY).

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[1]Contribution No. 63 from the Herbarium of West Virginia University.
*Contr. U. S. Nat'l Herb. 13: 359-374. 1911.
†Jour. Wash. Acad. Sci. 20: 43-52. 1930.
‡Ecol. Mon. 21: 269-300. 1951.

ASTRAGALUS DISTORTUS Torrey & Gray Fl. N. Amer. 1: 333. 1838

This, of course, is not restricted to the sale barrens, its principal occurrence being on dry soils of the prairie region; the Appalachian distribution, however, is disjunct and limited to the barrens.

TEXAS. — Archer Co.: Lake Olney, *Wm. L. McCart*, Apr. 1, 1938 (NY). Young Co.: Olney, *Wm. L. McCart*, Apr. 1, 1939 (NY). Clay Co.: Henrietta, *J. B. McBryde*, Apr. 1, 1938 (NY). Tarrant Co.: *Albert Ruth*, Apr. 12, 1919 (Ph); Handley, *Albert Ruth* 1205, June 4, 1925 (NY). Johnson Co.: Cleburne, *J. Reverchon* (Ph). Washington Co.: *Eunice Brackett*, May 1, 1938 (NY). Harris Co.: Houston, *E. Hall* (NY). Chambers Co.: *B. C. Tharp*, Apr. 9, 1936 (NY), May 7, 1936 (NY). San Augustine Co.: San Augustine, *E. J. Palmer* 7103, Mar. 30, 1915 (Ph). Harrison Co.: Marshall, *F. S. Earle* 5, Apr. 28, 1902 (NY), *E. J. Palmer* 7280 (Ph).

OKLAHOMA. — Johnston Co.: Mannsville, *Florence Griffith* 3458, May, 1916 (NY). Tishomingo, *H. W. Houghton* 3602, Apr. 8, 1916 (NY). Creek Co.: Sapulpa, *C. B. Williams*, May 21, 1924 (Ph). Craig Co.: Vinita, *M. A. Carleton*, Apr. 21, 1891 (NY).

LOUISIANA. — Caddo Parish: Shreveport, *E. J. Palmer* 7077, Mar. 28, 1915 (Ph). Acadia Parish: Crowley, *Small & Wherry* 11759, Apr. 10, 1925 (NY).

MISSISSIPPI. — Lowndes Co.: Columbus, *Spillman* (NY).

ARKANSAS. — Hemstead Co.: *Wm. B. Canby, C. S. Sargent, W. Trelease, & B. F. Bush*, Apr. 18, 1901 (Ph). Polk Co.: Vandervort, *D. Demaree*, May 6, 1929 (US). Sebastian Co.: Fort Smith, *E. T. Wherry*, Apr. 29, 1934 (WVa). Washington Co.: Fayetteville, *F. L. Harvey*, 1882 (Ph). Garland Co.: Crystal Springs, *Delzie Demaree* 21978, Apr. 26, 1941 (NY). Hot Spring Co.: Malvern, *Delzie Demaree* 14531, Apr. 17, 1937 (NY).

KANSAS. — Cherokee Co.: Prairie, *A. S. Hitchcock* 1014, May 7, 1897 (US, NY).

MISSOURI. — Jasper Co.: Webb City, *B. F. Bush* 1622, May 12, 1902 (NY), *B. F. Bush* 10464, May 6, 1926 (US); Joplin, *H. C. Benke*, Apr. 30, 1930 (US). Dade Co.: Turnback, *E. J. Palmer* 35607, May 5, 1929 (G). Greene Co.: Springfield, *J. W. Blankinship*, 1888 (US), 1889 (G), *Paul C. Standley*, Apr. 10, 1905 (Ph). Shannon Co.: Montier, *B. F. Bush* 202, May 15, 1894 (NY), *B. F. Bush* 1497, May 3, 1902 (US). Jackson Co.: Dodson, *B. F. Bush* 276, May 10, 1896 (US), *B. F. Bush* 1666A, May 14, 1902 (NY); Greenwood, *B. F. Bush* 10490, May 20, 1926 (US); Lee's Summit, *K. K. Mackenzie*, May 22, 1898 (G).

Franklin Co.: Morley, *G. W. Letterman*, June 1883 (NY) (Ph). St. Louis Co.: Allenton, *G. W. Letterman*, May 20, 1887 (NY). Putnam Co.: *S. C. Swollen*, June 16, 1856 (NY). Adair Co.: Kirksville, *Chas. S. Sheldon*, June 5, 1885 (NY).

Iowa. — Page Co.: Clarinda, *A. A. Berry Seed Co.*, July 1918 (G). Decatur Co.: *Fitzpatrick & Fitzpatrick*, May 29, 1899 (NY). Davis Co.: Addsville, *Ada Hayden* 11304, Apr. 26, 1938 (Ph). Wapello Co.: Eldon, *Ada Hayden* 9346, May 11, 1939 (NY), *B. Shimek*, May 4, 1902 (WVa). Muscatine Co.: *Estle & Brown*, Summer, 1935 (NY); Fruitland, *B. Shimek*, June 6, 1923 (WVa). Benton Co.: Vinton, *J. J. Davis*, 1877 (US).

Illinois. — Mason Co.: *Hall*, 1863 (NY, Ph), *S. B. Mead*, June 18, 1845 (NY). Menard Co.: Athens, *E. Hall*, May 1864 (US, NY). Cass Co.: Beardstown, *F. E. McDonald*, May 1906 (G), *L. B. Mead*, May 13, 1846 (Ph).

West Virginia. — Hardy Co.: Moorefield, *C. F. Millspaugh* 1426, May 1892 (NY). Mineral Co.: 4 mi. w. Burlington, *Alexander, Everett, Pearson*, Aug. 25, 1933 (NY), *E. J. Alexander*, May 30, 1939 (NY); Burlington, *Earl L. Core*, Aug. 17, 1931 (NY).

Virginia. — Shenandoah Co.: Short Mt., *H. A. Allard* 4511, Apr. 24, 1938 (US, NY, G), 4589, Apr. 30, 1938 (US), 7627, May 5, 1940 (US, NY, T), 9857, May 2, 1942 (US); Mt. Jackson, *Lena Artz* 532, May 26, 1935 (US); Milford Gap, *Lena Artz* 886, June 8, 1948 (G); Powell's Fort Valley, *Lena Artz* 610 (G).

Clematis albicoma Wherry Jour. Wash. Acad. Sci. 21: 198. 1931.

West Virginia. — Greenbrier Co.: White Sulphur Springs, *G. Guttenberg*, July 31, 1877 (US, type), *N. L. Britton*, Aug. 19, 1890 (NY, Ph), *J. K. Small*, May 12, 1892 (US, NY), *Brown & Small*, May 15, 1892 (Ph), *J. K. Small*, May 16, 1892 (US, G, Ph, M), *Addison Brown*, May 16, 1892 (NY), July 22, 1892 (G), *N. L. Britton*, May 16, 1897 (NY), *K. K. Mackenzie* 365, Aug. 27, 1903 (G, M), *Marion S. Franklin*, Sept. 4, 1920 (G), *P. D. Strausbaugh*, Sept., 1925 (WVa), *W. V. U. Bot. Exped.*, July 26, 1930 (WVa), *Earl L. Core*, June 10, 1931 (NY, G), *Martin & Erlanson* 32, Sept. 5, 1936 (NY, Ph), *F. A. Gilbert*, Sept. 5, 1936 (G), *Earl L. Core* 4732, May 4, 1937 (WVa), *Hermann & Martin*, May 21, 1939 (US, NY, G, Ph, WVa, M), *Wm. E. Brown*, July 18, 1940 (M). Pendleton Co.: Brandywine, *Earl L. Core* 3662, Aug. 14, 1931 (NY), 6648, Apr. 30, 1938 (WVa).

Virginia. — Montgomery Co.: Ironto, *E. T. Wherry*, June 12, 1939 (G). Alleghany Co.: Covington, *E. T. Wherry*, June 8, 1929

(NY); *Carroll E. Wood, Jr.* 6835, Sept. 12, 1946 (G). Bath Co.: Hot Springs, *F. W. Hunnewell* 4004, May 11, 1916 (G), 4763, July 3, 1917 (G); *E. T. Wherry*, June 10, 1930 (Ph); Warm Springs, *Earl L. Core*, Aug. 6, 1931 (NY). Augusta Co.: Deerfield Valley, *E. P. Killip* 30998, May 24, 1933 (US). Highland Co.: Headwaters, *E. J. Alexander*, May 30, 1938 (NY).

CLEMATIS ALBACOMA, VAR. COACTILIS Fernald *Rhodora* 45:407. 1943.

VIRGINIA. — Roanoke Co.: 2¼ mi. N.E. Hanging Rock, *Carroll E. Wood, Jr.* 6082, June 30, 1946 (G, type); 2 mi. N.N.E. Hanging Rock, *Carroll E. Wood, Jr.* 3432, June 30, 1942 (G, Ph), 3433, June 30, 1942 (G); 2¼ mi. N.E. Hanging Rock, *Carroll E. Wood, Jr.* 127, Apr. 1940 (G), 3446a, June 30, 1942 (G); 1¼ mi. N. Hanging Rock, *Carroll E. Wood Jr.* 2787a, June 24, 1942 (G, Ph); Roanoke, *Edmund T. Burnett* (Ph); Roanoke, *Elizabeth G. Britton* & *Anna M. Vail*, May 16, 1892 (Ph); 2.9 mi. N.N.W. Dixie Caverns, *Carroll E. Wood, Jr.* 3920 (G, Ph). Pulaski Co.: 5 3/4 mi. S.E. Pulaski, *Carroll E. Wood, Jr.* 6738, Sept. 1, 1946 (S.W. limit of range) (G). Montgomery Co.: 1 mi. E. Ironto, *Carroll E. Wood Jr.* 6710, Aug. 31, 1946 (G), *E. T. Wherry*, June 12, 1939 (G). Craig Co.: 3.5 mi. S. of Newcastle, *E. T. Wherry*, June 12, 1939 (G). Botetourt Co.: Eagle Rock, *Ruskin S. Freer* 242, June 12, 1933 (G), Carroll E. Wood Jr., 6812, Sept. 11, 1946 (G), *I. F. Lewis*, Apr. 27, 1929 (Ph), *E. T. Wherry*, June 12, 1933 (Ph).

CONVOLVULUS PURSHIANUS Wherry Proc. Pa. Acad. Sci. 7: 163. 1933.

WEST VIRGINIA. — Monroe Co.: Slaty Mt., Sweet Springs, *E. T. Wherry*, Aug. 12, 1924 (US), June 1, 1929 (US). Greenbrier Co.: White Sulphur Springs, *Kenneth K. Mackenzie*, Aug. 27, 1903 (NY), *Earl L. Core* 2707, June 10, 1931 (NY, WVa), *F. J. Hermann* 10303, May 21, 1939 (G), *F. A. Gilbert* 517, Sept. 5, 1936 (G), *Lee Sowden*, June 14, 1924 (Ph), *Mr.* & *Mrs. H. A. Davis* 744, May 13, 1937 (WVa). Pocahontas Co.: Laurel Creek, Rimel, *Earl L. Core* 3471, Aug. 6, 1931 (G). Pendleton Co.: Smoke Hole, *W. V. U. Biol. Exped.*, July 18, 1941 (WVa). Grant Co.: Landes, *E. T. Wherry*, May 31, 1929 (US); Scherr, *Mr.* & *Mrs. H. A. Davis* 741, June 10, 1937 (WVa). Hardy Co.: Wardensville, *F. W. Hunnewell* 12417, July 10, 1932 (G), *Earl L. Core* 4380, Aug. 12, 1932 (WVa); Moorefield, *Mr.* & *Mrs. H. A. Davis* 2051, June 16, 1938 (WVa). Mineral Co.: Ridgeville, *Earl L. Core, James C. Myers,* & *Elizabeth Ann Bartholomew*, May 31, 1940 (WVa). Hamp-

shire Co.: Frenchburg, *Alexander, Everett & Pearson*, Aug. 25, 1933 (NY); Hanging Rock, *Wilbert Frye* 585, May 26, 1932 (WVa). Morgan Co.: Largent, *Donald Samson*, June 1, 1938 (NY).

Virginia. — Roanoke Co.: Hanging Rock, *Carroll E. Wood, Jr.* 3431, June 30, 1942 (Ph). Bedford Co.: Peaks of Otter, *Brown, Hogg, Vail, Timmerman, Dr. & Mrs. Britton*, May 30-June 9, 1890 (NY). Alleghany Co.: N. of Covington, *E. H. Walker* 1627, June 27, 1931 (US). Rockbridge Co.: Natural Bridge Station, *B. Long & E. B Bartram*, May 30, 1909 (G, Ph). Bath Co.: Vicinity of Millsboro, *E. S. Steele*, Sept. 3, 1906, Aug. 31, 1906, Aug. 26, 1906 (US), *C. F. Wheeler & E. S. Steele* Sept. 2, 1907 (US). Augusta Co.: Vicinity of Augusta Springs, *E. S. Steele*, Sept. 2, 1908 (US). Highland Co.: Shenandoah Mt., *E. P. Killip* 32455, June 5, 6, 1938 (US); Bull Pasture Mt., *P. A. Rydberg* 9008, June 13, 1925 (NY); Headwaters, *Wherry & Pennell* 13371, Aug. 25, 1927 (Ph). Shenandoah Co.: New Market, *Lena Artz*, May 19, 1934 (US); Massanutten Mt., *H. A. Allard* 6605, May 24, 1939 (US), 8794, June 6, 1941 (US, NY, G, M); Edinburgh Gap, *Earl L. Core*, May 27, 1939 (WVa).

Maryland. — Allegany Co.: 1 mi. N. of Flintstone, *E. T. Wherry*, May 30, 1928 (US, G).

Pennsylvania. — "Aleg. Mt. Pa.", *C. W. Short*, June, 1851 (Ph). Bedford Co.: Chaneysville, *E. T. Wherry*, June 17, 1932 (Ph). Fulton Co.: Harrisonville, *Carroll E. Wood Jr.* 20004, June 4, 1942 (G); Saluvia, *E. T. Wherry*, June 17, 1932 (Ph). Franklin Co.: Mercersburg, *T. C. Porter* (Ph). Huntingdon Co.: Charter Oak, *W. C. Muenscher*, June 13, 1920 (US). Centre Co.: 4 mi. s. Centre Hill, *H. A. Wahl* 1391, Aug. 18, 1943 (G, M); Collyer, *H. A. Wahl* 1699, June 2, 1946 (G); Montour Co.: Washingtonville, *C. C. Zeliff*, July 13, 1933 (G).

Eriogonum alleni Watson Gray's Manual, 6th ed., p. 734. 1889.

West Virginia. — Monroe Co.: Cove Road, Sweet Springs, *Mr. & Mrs. Steele* 309, Sept. 14, 1903 (US, NY, M); Slaty Mt., *F. A. Gilbert* 497, Sept. 5, 1936 (G); 4 mi. n. of "Old Sweet", *Mr. & Mrs. Steele*, Sept. 14, 1903 (G); 2¼ mi. n.w. of Sweet Springs, *Arthur N. Leeds* 272, Aug. 3, 1931 (Ph); Slaty Mt., *Earl L. Core*, July 25, 1945 (WVa), *W. V. U. Bot. Exped.*, July 20, 1928 (WVa), July 23, 1929 (WVa). Greenbrier Co.: White Sulphur Springs, *K. K. Mackenzie* 374, Aug. 27, 1903 (US, NY, Ph, M, G), *T. F. Allen* (NY, G), *F. H. Sargent* 139, July 28, 1947 (G), *W. V. U. Bot. Exped.*, Aug. 4, 1926 (WVa), *E. E. Berkley* 1208, July 23, 1930 (M).

VIRGINIA. – "Western Virginia", *T. F. Allen*, 1872 (NY). Montgomery Co.: Ironto, *A. B. Massey* 3936, Aug. 1, 1940 (NY, G, WVa), *Carroll E. Wood, Jr.*, 6708, Aug. 31, 1946 (G). Botetourt Co.: Eagle Rock, *Carroll W. Wood, Jr.* 6631, Aug. 23, 1946 (G). Alleghany Co.: Cowpasture River, *Carroll E. Wood, Jr.* 6840, Sept. 12, 1946 (G); Potts Creek, 7 mi. from Covington, *Griscom & Hunnewell* 18698, July 4, 1933 (G). Bath Co.: Vicinity of Millboro, *E. S. Steele*, Sept. 6, 1906 (US, NY), Sept. 17, 1907 (US); Alleghany Mt., *Earl L. Core* 3506, Aug. 6, 1931 (NY, WVa); Warm Springs, *Earl L. Core* 3520, Aug. 6, 1931 (NY); Millboro, *Adams & Wherry* 2115, Sept. 11, 1935 (G). Highland Co.: Headwaters, *E. P. Killip* 32462, June 5, 6, 1938 (US), *Miss E. S. Rawlinson* 136, Aug. 10, 1933 (US), *Alexander, Everett, & Pearson*, Aug.-Oct., 1933 (NY). Shenandoah Co.: Massanutten Mt., *Griscom & Hunnewell*, June 30, 1933 (US, NY); Woodstock, *J. T. Baldwin* 5366, Aug. 26, 1945 (G); Edinburgh, *F. W. Hunnewell* 12557, Sept. 18, 1932 (G); McInturf Gap, *F. W. Hunnewell*, June 30, 1933 (G), *Griscom & Hunnewell*, June 30, 1933 (Ph, W. Va. M).

OENOTHERA ARGILLICOLA Mackenzie Torreya 4: 56. 1904.

WEST VIRGINIA. – Summers Co.: Near Hinton, *Weldon Boone* 511, Aug. 8, 1933 (WVa). Monroe Co.: Sweet Springs, *Mr. & Mrs. Steele* 328, Sept. 14, 1903 (US, NY, G); Slaty Mt., *F. A. Gilbert* 502, Sept. 5, 1936 (G). Greenbrier Co.: White Sulphur Springs, *K. K. Mackenzie* 1926, Oct., 1905 (US, G), 373 Aug. 27, 1903 (NY-type, G), *Griscom & Hunnewell* 8670, July 5, 1933 (G), *W. V. U. Bot. Exped.*, July 29, 1927 (WVa); 5 mi. w. White Sulphur Springs, *L. F. & F. R. Randolph*, Aug. 13, 1922 (G); Kate's Mt., *Marion S. Franklin*, Sept. 4, 1920 (G); near Alvon, *C. M. Smithson*, June 28, 1938 (WVa). Pendleton Co.: Brandywine, *Earl L. Core*, Aug. 14, 1931 (NY, WVa). Hardy Co.: Wardensville, *H. A. Allard* 19749, Aug. 5, 1950 (US), *Earl L. Core* 1382, Aug. 12, 1932 (WVa). Mineral Co.: 3 mi. s. Ridgeley, *E. T. Wherry*, Aug. 8, 1933 (WVa). Hampshire Co.: 4 mi. e. Springfield, *Wilbert M. Frye*, July 30, 1947 (US); Levels, *Wilbert Frye*, Aug. 18, 1934 (WVa). Morgan Co.: Great Cacapon, *Mr. & Mrs. Davis* 3093, July 27, 1939 (WVa); Largent, *Earl L. Core* 3815, Aug. 20, 1931 (WVa), *Alexander, Everett & Pearson*, Aug. 25, 1933 (NY); 3 mi. n. e. Largent, *E. T. Wherry*, Aug., 1932.

VIRGINIA. – Botetourt Co.: $1\frac{1}{2}$ mi. w.n.w. Eagle Rock, *Carroll E. Wood Jr.* 6802, Sept. 11, 1946 (G). Alleghany Co.: 8 mi. s.w. Covington, *Philip A. Munz* 13484, Aug. 18, 1935 (US, G); Covington, *Philip A. Munz* 13485, Aug. 18, 1935 (NY), *F. H. Sargent* 140, July

28, 1947 (G); Clifton Forge, *Alexander, Everett & Pearson*, Aug. 28, 1933 (NY); 1½ mi. w. Covington, *Carroll E. Wood Jr.* 6834, Sept. 12, 1946 (G); 7 mi. from Covington, *Griscom & Hunnewell* 18697, July 4, 1933 (G). Rockbridge Co.: Millboro Springs, *Philip A. Munz* 13489, Aug. 18, 1935 (US, NY). Bath Co.: Vicinity of Millboro, *E. S. Steele*, Sept. 5, 1906 (US), Sept. 17, 1907 (US). Augusta Co.: Deerfield, *H. A. Allard* 2052, Aug. 2, 1936 (US, G), 3279, July 19, 1937 (US, G); Calf Pasture River, *Eliz. S. Rawlinson* 273, Sept. 2, 1934 (US). Highland Co.: Headwaters, *Wherry & Pennell* 13377, Aug. 27, 1927 (M). Shenandoah Co.: Massanutten Mt., *Lena Artz*, Aug. 17, 1934 (US), Aug. 26, 1934 (US), 890, Sept. 6, 1948 (G).

Maryland. — Allegany Co.: Cumberland, *Shreve & Jones* 951, July 25, 1906 (US).

Pennsylvania. — Bedford Co.: 0.7 mi. w.n.w. Saxton, *D. Berkheimer* 3450, Sept. 5, 1942 (G). Huntingdon Co.: Orbisonia, *E. T. Wherry*, Aug. 7, 1932 (NY); e. of Huntingdon, *E. T. Wherry*, Aug. 7, 1932 (NY); Hahn's Bridge, *J. P. Kelly*, Sept. 16, 1940 (G). Perry Co.: Losh Run, *J. K. Small*, Aug. 21, 1921 (NY).

Phlox buckleyi Wherry Jour. Wash. Acad. Sci. 20: 26. 1930.

West Virginia. — Summers Co.: Marie, *Weldon Boone*, May 11, 1938 (WVa). Greenbrier Co.: 1 mi. e. Caldwell, *E. T. Wherry*, June 1, 1929 (US, Ph); White Sulphur Springs, *Marion S. Franklin*, Sept. 4, 1920 (G), *E. T. Wherry*, June 1, 1929 (G, Ph, WVa), *Buckley*, June, 1838 (M, type). Pocahontas Co.: 4 mi. s. Driscoll, *E. T. Wherry*, June 14, 1932 (Ph).

Virginia. — Montgomery Co.: Ironto, *A. B. Massey* 1938, May 17, 1938 (Ph); Layman, *A. B. Massey* 183, May 7, 1938 (Ph). Craig Co.: Barbour Cr., near Newcastle, *A. B. Massey* 1834, May 8, 1938 (Ph); n.e. of Newcastle, *A. B. Massey* 1840, May 8, 1938 (Ph); Craig's Creek, *E. T. Wherry*, June 12, 1932 (Ph). Alleghany Co.: 1 mi. n. Alleghany Station, *E. T. Wherry*, June 8, 1929 (Ph); Natural Well, *Mrs. J. Norman Henry* 29155, June 5, 1941 (Ph); Longdale Furnace, *E. T. Wherry*, June 8, 1929 (Ph). Bath Co.: "Bath Co.", *Mrs. J. Norman Henry* 1242, Hot Springs, *F. W. Hunnewell* 4733, July 2, 1917 (G), *E. T. Wherry*, June 13, 1932 (Ph); 3½ mi. n.w. Mountain Grove, *Mary G. Henry* 2911, June 5, 1941 (Ph), *E. T. Wherry*, June 14, 1932 (Ph); May 20, 1938 (Ph); Nimrod Hall, *Lee Sowden*, June, 1921 (Ph); 1 mi. w.s.w. Bacova, *Mary G. Henry* 2922, June 7, 1941 (Ph); Warm Springs Mt., *Mary G. Henry* 2925, June 7, 1941 (Ph); Bacova, *E. T. Wherry*, June 13, 1932 (Ph); 2½ mi. n. Green Valley, *E. T.*

Wherry, June 5, 1939 (Ph); High Top, *Mrs. J. Norman Henry* 292111, June 6, 1941 (Ph); Warm Springs, *E. T. Wherry*, June 10, 1930 (Ph); Augusta Co.: Craigsville, *Eliz. S. Rawlinson* 300, May 26, 1935 (US); Franklin Hollow, *Elizabeth S. Rawlinson* 292, May 26, 1935 (Ph). Rockingham Co.: North River Gap, *E. S. Rawlinson*, May 30, 1935 (Ph).

SOLIDAGO HARRISII Steele Contr. U. S. Natl. Herb. 13: 369. 1911.

WEST VIRGINIA. — Monroe Co.: n. of Sweet Springs, *Mr.* & *Mrs. Steele* 305, Sept. 14, 1903 (US, NY). Greenbrier Co.: White Sulphur Springs, *Marion S. Franklin*, Sept. 4, 1920 (NY). Grant Co.: Cabins, *Mr.* & *Mrs. Davis* 1733, June 14, 1938 (WVa, in flower), 1963, Sept. 1, 1938 (WVa). Hampshire Co.: 1 mi. n. Romney, *Wilbert M. Frye*, June 27, 1947 (US); North River Mills, *Mr.* & *Mrs. Davis* 4191, Aug. 19, 1940 (WVa).

VIRGINIA. — Bath Co.: Vicinity of Millboro, *E. S. Steele*, Sept. 17, 1907 (US, NY), Aug. 21, 1907 (US, NY). Augusta Co.: Augusta Springs, *E. S. Steele*, Aug. 29, 1908 (US); Fordwick to Craigsville, *E. S. Steele* 106, Sept. 2, 1913 (NY, M), 114, Sept. 5, 1913 (US, M), 212, Sept. 16, 1913 (NY, M). Shenandoah Co.: Woodstock, *H. A. Allard* 5623, Sept. 22, 1938 (NY); Three Top Mt., Massanutten Mt., *F. J. Hermann* 9831, Sept. 22, 1938 (NY). Warren Co.: Massanutten Mt., *F. W. Hunnewell* 16943, Sept. 17, 1940 (NY). Frederick Co.: Brush Creek, *F. W. Hunnewell* 16969, Sept. 16, 1940 (NY).

MARYLAND. — Allegany Co.: Cumberland, *Edw. Harris*, June 20, 1910 (US, in flower, type, Ph); Clinton Ridge, *G. M. Perdew*, May, June, 1910 (NY, in flower).

PSEUDOTAENIDIA MONTANA Mackenzie Torreya 3: 159. 1903.

WEST VIRGINIA. — Summers Co.: near Hinton, *Weldon Boone* 75, Apr. 13, 1932 (WVa). Monroe Co.: Slaty Mt., Sweet Springs, *E. T. Wherry*, Aug. 12, 1924 (US), *W. V. U. Bot. Exped.*, July 29, 1927 (WVa), July 22, 1929 (WVa), *Earl L. Core*, June 10, 1931 (WVa). Greenbrier Co.: Kate's Mt., White Sulphur Springs, *Kenneth K. Mackenzie*, Aug. 29, 1903 (NY, type G, M), *Maurice G. Brooks*, Apr. 13, 1945 (WVa). Pendleton Co.: Smoke Hole, *W. V. U. Bot. Exped;* Aug. 9, 1929 (WVa), *A. J. Sharp*, July 18, 1941 (WVa). Grant Co.: Cabins, *Mr.* & *Mrs. Davis* 707, June 10, 1937 (WVa), 3167, July 13, 1939 (WVa), 4844, June 20, 1942 (G) *So. App. Bot. Club*, Apr. 29, 1939 (WVa). Hardy Co.: e. of Moorefield, *E. T. Wherry*, July 21, 1933 (US); Lost City, *Earl L. Core*, Aug. 18, 1931 (NY, G); Moorefield,

E. T. Wherry, July 20, 1933 (Ph); Fort Run, *E. T. Wherry*, July 20, 1933 (WVa); Great North Mt., *Ross Ludwig* 390, Aug. 12, 1932 (WVa). Mineral Co.: 3 mi. s. Ridgeley, *E. T. Wherry*, Aug. 8, 1933 (U. S., NY, Ph, WVa). Hampshire Co.: Shanks, *E. T. Wherry*, May 30, 1929 (NY); Hanging Rock, *Wilbert Frye*, May 13, 1933 (WVa).

Virginia. — Roanoke Co.: Hanging Rock, *Carroll E. Wood, Jr.*, 3402, June 30, 1942 (G). Rockbridge Co.: near Lexington, *J. R. Churchill*, Aug. 26, 1924 (G, M). Alleghany Co.: 3 mi. n. Covington, *Earl L. Core* 4900, Sept. 6, 1936 (WVa). Bath Co.: Millboro Springs, *E. P. Killip* 32479, June 5, 6, 1938 (US); s. of Millboro, *Carroll E. Wood, Jr.* 6857, Sept. 12, 1946 (G); Hot Springs, *F. W. Hunnewell* 4798, July 5, 1917 (G); 2½ mi. w.n.w. Hot Springs, *E. T. Wherry*, July 11, 1926 (Ph). Augusta Co.: Stribling Springs, *E. S. Steele* 51, Aug. 29, 1917 (US). Greene Co.: Bear Fence Mt., *E. H. Walker* 2939, July 28, 1940 (US). Page Co.: Upper Overall Run, *E. H. Walker* 2695, Aug. 14, 1938 (US); Stony Man Mt., near Luray, *Mr. & Mrs. Steele* 6, Aug. 20, 1901 (US, NY, G). Rappahannock Co.: Shenandoah National Park, *E. H. Walker* 1128, July 20, 1930 (US). Shenandoah Co.: Newmarket, *E. T. Wherry*, July 26, 1933 (US); Orkney Springs, *E. S. Steele*, Sept. 1, 1911 (US), Sept. 4, 1911 (US), Sept. 15, 1911 (US); Alum Springs, *E. T. Wherry* July 2, 1933 (Ph), July 21, 1933 (NY); Toms Brook, *F. W. Hunnewell* 11161, June 2, 1929 (G); Great North Mt., *E. S. Steele*, Aug. 22, 1911 (G). Frederick Co.: w. of Winchester, *F. W. Hunnewell* 10710, July 17, 1928 (G); Hayfield, *G. Ledyard Stebbins*, Apr. 12, 1933 (G).

Maryland. — Allegany Co.: 1 mi. n. Oldtown, *E. T. Wherry*, Aug. 8, 1933 (US, Ph); Polish Mt., *Chas. Piper Smith* 3184, Sept. 10, 1918 (G).

Pennsylvania. — Bedford Co.: 5½ mi. s. Chaneysville, *E. T. Wherry*, Aug. 11, 1940 (G, Ph); 6½ mi. s. Chaneysville, *E. T. Wherry*, Aug. 11, 1940 (G, Ph); 2½ mi. s.s.w. Hewitt, *E. T. Wherry*, Aug. 11, 1940 (see Jour. S. App. Bot. Club 2: 1, 2. 1937).

Senecio antennariifolius Britton Britton & Brown, Illus. Flora 3: 478. 1898

West Virginia. — Monroe Co.: Slaty Mt., *Earl L. Core* 2702, June 10, 1931 (NY, Ph), *F. A. Gilbert* 500, Sept. 5, 1936 (G). Greenbrier Co.: White Sulphur Springs, *N. L. Britton*, May 16, 1897 (NY), *Brooks & Core* 4738, May 4, 1935 (NY, G). Grant Co.: Cabins, *Mr. & Mrs. Davis* 1745, May 1, 1938 (Ph). Hardy Co.: Wardensville, *F. W. Hunnewell* 12416, July 10, 1932 (G), *Earl L. Core* 4376, Aug. 12,

1932 (WVa). Morgan Co.: Largent, *E. J. Alexander*, May 29, 1938 (NY); Great Cacapon River, *P. D. Strausbaugh*, in 1939 (WVa). Berkeley Co.: Camp Frame, *H. Ivon Shreve*, May 2, 1937 (WVa).

Virginia. — "Blue Ridge, Va.", *Buckley* in 1838 (NY, type, G). Montgomery Co.: Price's Fork, *A. B. Massey* 2966, May 18, 1939 (M); Blacksburg, *A. B. Massey*, May 22, 1927 (M). Roanoke Co.: 2.9 mi. n.n.w. Dixie Caverns, *Carroll E. Wood Jr.* 3922, July 13, 1942 (G). Botetourt Co.: Eagle Rock, Craig Cr., *Carroll E. Wood, Jr.* 6803, Sept. 11, 1946 (G), Cove Mt., *Ruskin S. Freer* 1210, Mar. 31, 1947 (G). Alleghany Co.: Wilson Creek, *Carroll E. Wood, Jr.* 6825, Sept. 12, 1946 (G). Rockbridge Co.: Goshen, *J. R. Churchill*, Apr. 28, 1915 (G), May 5, 1915 (M); Glasgow, *Mr. & Mrs. Davis* 1758, Apr. 15, 1938 (WVa); e. of Natural Bridge, *Edwin B. Bartram*, May 31, 1909 (G, Ph). Amherst Co.: Rocky Row Mt., *Ruskin S. Freer* 1211, Mar. 31, 1947 (G). Bath Co.: Millsboro Springs, *Adams & Wherry* 2416, Sept. 11, 1935 (G), *Carroll E. Wood, Jr.*, 6848, Sept. 12, 1946 (G); Hot Springs, *F. W. Hunnewell* Apr. 19-20, 1915 (G), July 5, 1917 (G); Duns Gap, 3 mi. n. of Hot Springs, *T. S. Githens*, May 12, 1946 (Ph). Shenandoah Co.: Signal Knob, Massanutten Mt., *H. A. Allard* 104, May 8, 1934, (US, NY, G); s. end of Short Mt., Massanutten Mt., *H. A. Allard* 1480, Apr. 24, 1938 (US, NY, G), 1483, Apr. 24, 1938 (US, M), Mt. Jackson, Massanutten Mt., 7626, May 5, 1940 (US, NY, G, M); Massanutten Mt., *H. A. Allard* 7665 (US); Powell's Fort, *Lena Artz* 319, Apr. 28, 1935, (G, M); Elizabeth Furnace, *Lena Artz* 911, Apr. 23, 1948, (G); Three Top Mt., *F. W. Hunnewell*, Apr. 21, 1930, (G); Woodstock, *F. J. Hermann* 9835, Sept. 22, 1938 (M).

Maryland. — Allegany Co.: Gilpin, *E. T. Wherry*, May 30, 1928 (NY). Washington Co.: Hancock, *F. W. Hunnewell* 10588, May 5, 1928 (G).

Pennsylvania. — Fulton Co.: 6½ mi. w. McConnelsburg, *David Berkheimer* 584, May 13, 1939 (G).

Trifolium virginicum Small Mem. Torr. Bot. Club 4: 122. 1894.

West Virginia. — Monroe Co.: Slaty Mt., *W. V. U. Bot. Exped.*, July 20, 1928 (WVa), *Eva M. Fling Roush* 820, July 30, 1927 (M). Greenbrier Co.: Kates Mt., *John K. Small*, May 16, 1892 (US, NY type, Ph, M), *A. Brown & J. K. Small*, May 16, 1892 (NY), *A. A. Heller*, May 17, 1893 (US, NY, Ph, M), *P. D. Strausbaugh*, Sept. 1, 1925 (WVa), *E. T. Wherry*, June 1, 1929 (US), *R. F. Martin & C. O. Erlanson* 33, Sept. 5, 1936 (Ph); White Sulphur Springs, *N. L. Britton*, May

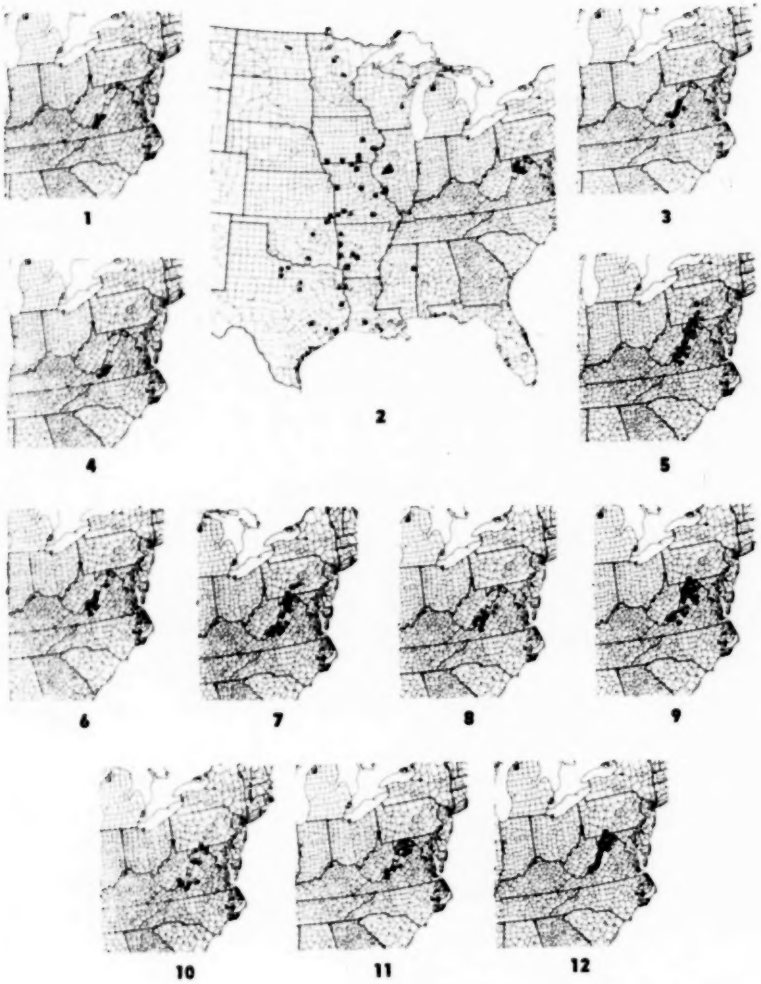
16, 1897, *Brooks & Core* 4736, May 4, 1935 (NY). Pendleton Co.: Upper Tract, *H. Dorsey*, May, 1916 (WVa). Grant Co.: Petersburg, *W. V. U. Bot. Exped.*, Apr. 9, 1939 (WVa). Hardy Co.: Wardensville, *Earl L. Core* 4377, Aug. 12, 1932 (WVa). Mineral Co.: 4 mi. w. Burlington, *Alexander, Everett, Pearson*, Aug. 25, 1933 (NY); Keyser, *Daisy Chapman*, May, 1929 (WVa); Ridgeville, *Earl L. Core*, May 31, 1940 (W.Va); Burlington, *W. V. U. Bot. Exped.*, June 25, 1927 (WVa) Hampshire Co.: Hanging Rock, *Wilbert Frye*, May 20, 1932 (WVa), June 6, 1933 (WVa); near Romney, *Stanley R. Harris*, Summer, 1937 (WVa). Morgan Co.: 1½ mi. n. w. Largent, *E. T. Wherry*, Aug. 1932 (WVa). Berkeley Co: Camp Frame, *J. Lloyd Poland*, June 11, 1935 (WVa), *H. Ison Shreve*, May 2, 1937 (WVa).

Virginia. — Alleghany Co.: 1½ mi. n. w. Covington, *E. T. Wherry*, June 8, 1929 (NY); 1½ mi. w. Covington, *Carroll E. Wood Jr.* 6829, Sept. 12, 1946 (G), *E. T. Wherry*, June 10, 1930 (Ph). Bath Co.: Warm Springs, *Earl L. Core* 3517, Aug. 6, 1931 (WVa); Mountain Grove, *E. T. Wherry*, June 14, 1932 (Ph). Highland Co.: Headwaters, *E. T. Wherry*, June 4, 1939 (Ph).[1] Shenandoah Co.: Massanutten Mt., *H. A. Allard* 4482, Apr. 24, 1938 (US); Powell's Fort, *Lena Artz*, May 11, 1935 (US); Milford Gap, Massanutten Mt., *Lena Artz* 885, June 8, 1948 (G); Passage Creek, Massanutten Mt., *Lena Artz* 884, June 8, 1948 (G). Frederick Co.: Gore, *E. T. Wherry*, May 30, 1929 (NY).

Maryland. — Allegany Co.: Gilpin, *E. T. Wherry*, May 30, 1928 (NY); Pratt, *E. T. Wherry*, June 17, 1932 (Ph).

Pennsylvania. — Bedford Co.: 2 mi. s. Hewitt, *E. T. Wherry*, Aug. 10, 1940 (Ph); Artemas, *E. T. Wherry*, June 17, 1932 (Ph, see Proc. Pa. Acad. Sci. 7: 161. 1933).

West Virginia University,
Morgantown



1, *Allium oxyphilum*; 2, *Astragalus distortus*; 3, *Clematis albicoma*; 4, *C. a.*, *var. coactilis*; 5, *Convolvulus purshianus*; 6, *Eriogonum allenii*; 7, *Oenothera argillicola*; 8, *Phlox buckleyi*; 9, *Pseudotaenidia montana*; 10, *Senecio antennariifolius*; 11, *Solidago harrisii*; 12, *Trifolium virginicum*.

Geum Canadense, A Study of Its Seasonal Periodicity in New Jersey

George H. Schneider, Jr.

Geum canadense is an herbaceous perennial which occurs throughout a large part of the eastern deciduous forest. According to Fernald ('50) it grows in thickets and borders of woods from Nova Scotia to Minnesota and south to South Carolina and Kansas. On the piedmont of New Jersey it is found commonly in oak woodlands.

The present study is based largely on observations of individuals of *Geum canadense* growing naturally in Mettler's Woods, an oak-hickory stand located near East Millstone, New Jersey (Bard '52). In addition to field observations some greenhouse experiments were undertaken.

The author is indebted to Dr. Murray F. Buell of the Rutgers University Botany Department.

Methods

In studying the periodicity of *Geum canadense* two general phases of analysis were employed. The first consisted of field work and the tabulation of data for a picture of periodicity in the natural habitat. The second was carried on with seedlings and with mature plants transplanted to the greenhouse.

Field Methods

This study was started in September 1950, at which time the plants were vigorously producing winter rosettes. Twelve healthy plants were selected, four in areas where the forest canopy was not complete, the others in areas of complete canopy cover. The following data were recorded weekly: (1) notes on the tree canopy, (2) number and position of new leaves formed in rosettes, (3) rate of leaf elongation recorded in mm., (4) changes in leaf form and pigmentation, (5) estimate of depth of litter and snow around and over plants from time of autumn leaf fall throughout winter, (6) notes on relative soil moisture and periods of freezing.

In addition periodic determinations were made of pH in the region of the roots using the Soil-tex (colorimetric) method. A weekly reading of temperatures was taken both near plants growing in openings in the woods and near others growing under full canopy. These were made in the early afternoon. In every case a reading was made of the temperature in the upper 2 cm. of soil and the air temperature within 5 cm. of the ground.

Weekly maximum and minimum temperatures of the soil at a depth of 4 cm. and air temperatures taken 2 cm. above the ground were available from current records made by Drs. M. F. Buell and J. A. Small. Seasonal readings of light interception by the canopy were available from the same source.

The time of changes in growth habit, budding, flowering, and maturing of fruit were recorded for the open and canopied areas. The location, time of first appearance, distribution and abundance of seedlings were also noted in respect to canopy openings. The previous flowering (determined by the long shoot remnants) of the individual plants was recorded.

Some data (collected by Drs. M. F. Buell and J. A. Small the preceding spring and summer) were available on the growth of *Geum canadense* in the same woodlot area.

Greenhouse Methods

In late September, when the study was started, most of the mature achenes still adhered to the receptacles. The achenes were gathered in October and sorted into two lots: those that had dried to a dark brown color, and those that had remained green. Four pots were filled with topsoil taken from Mettler's Woods. Two pots were shallowly planted with brown achenes and two with green. The pots were kept moist and at a normal greenhouse temperature of 70° F. Approximately one month after planting, on November 20, 1950, with no signs of germination noticeable, two of the pots (one with green achenes, the other with brown) were placed under freezing conditions outdoors.

The time of transplanting to the greenhouse was staggered from late fall through the winter months. Three transplantings were made at approximately two-month intervals. — November 12, 1950, January 6, 1951, and March 12, 1951. Twelve to fourteen plants were brought in from the woods each time and placed in pots filled with soil from the woodlot. Data were collected on the initiation of leaves, changes in plant form, and rate of leaf expansion in mm.

On March 12, 1951, 12 plants from each of the 3 transplantings were placed under 3 distinct photoperiods: (1) 4 of each under normal greenhouse light conditions, (2) 4 of each under extended daylight period of 17 hours, and (3) 4 of each under short daylight periods of 8 hours, making a total of 36 such plants under observation. As indicated below, 2 in each group received complete nutrient solution.

The long daylight period was controlled automatically by use of an electric time switch and incandescent bulbs.

The short daylight period was controlled each day manually by the use of two light-proofed corrugated boxes, the upper portion fitting over the lower but having approximately 1 inch clearance on all sides to allow for ventilation. Both were painted on all sides with a flat black light-absorbent darkroom paint, except for the outer surface of the upper box, which was painted with white gloss paint to aid in the reflection of light and heat.

Daily temperature recordings were made with Standard Weather Bureau maximum and minimum thermometers, placed with the plants of long and short photoperiods, to compare with the record of the normal greenhouse temperatures.

Two plants under each photoperiod were placed in sand cultures to determine the potentialities of the species when given a complete nutrient solution (Formula I, Shive and Robbins '48).

Data on plants were collected as to: (1) number and position of new leaves formed in the rosette; (2) rate of leaf elongation in mm. (3) changes in leaf form, plant form, and pigmentation.

Results

Field Plants

General Periodicity. — The periodicity of *Geum canadense* may be divided into 3 distinct stages: (1) seedlings, including first year winter rosette; (2) long shoot; (3) winter rosette of mature plant. The cycle of rosette alternating with long shoot appears to repeat itself.

Seedling Stage. — Field observations show that seeds of *Geum canadense* germinate in late summer or early fall. Early in September numerous seedlings which had just started can be found in the general vicinity of the mature plants. The mature plants which were located in the more open wooded areas, e.g. a wood road or opening caused by a fallen tree, produced an average of 17 seedlings per 1 square meter quadrat around the plants; those plants under a full canopy in the woods produced an average of 4 seedlings per 1 square meter quadrat around the plants. In the spring the same quadrats were checked again and no increase in number of seedlings was noted over the fall counts.

The first-formed true leaves are small with serrate margins (figure 1a) and number from 2 to 4. If such plants start in August or September, the first leaves continue to expand and reach a length

of about 7 cm. by spring. Three or four more may then form in the autumn which are trifoliolate (figure 1b), and finally reach a length of about 14 cm. If germination is later, the first true leaves do not exceed 3 cm. in length, and the rosette does not form until early in the spring. If seedlings have had an early start, the rosette, typical of the mature plants with pinnate leaves (figure 1c), is formed.

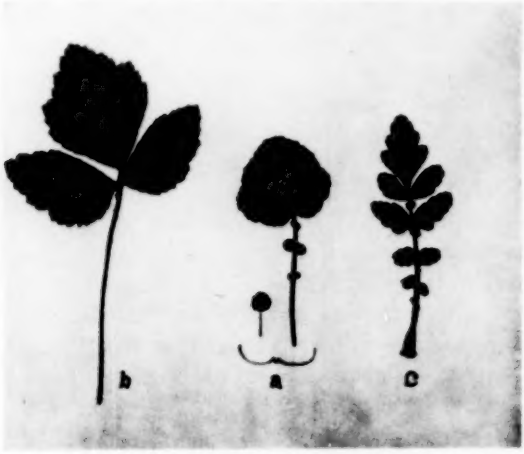
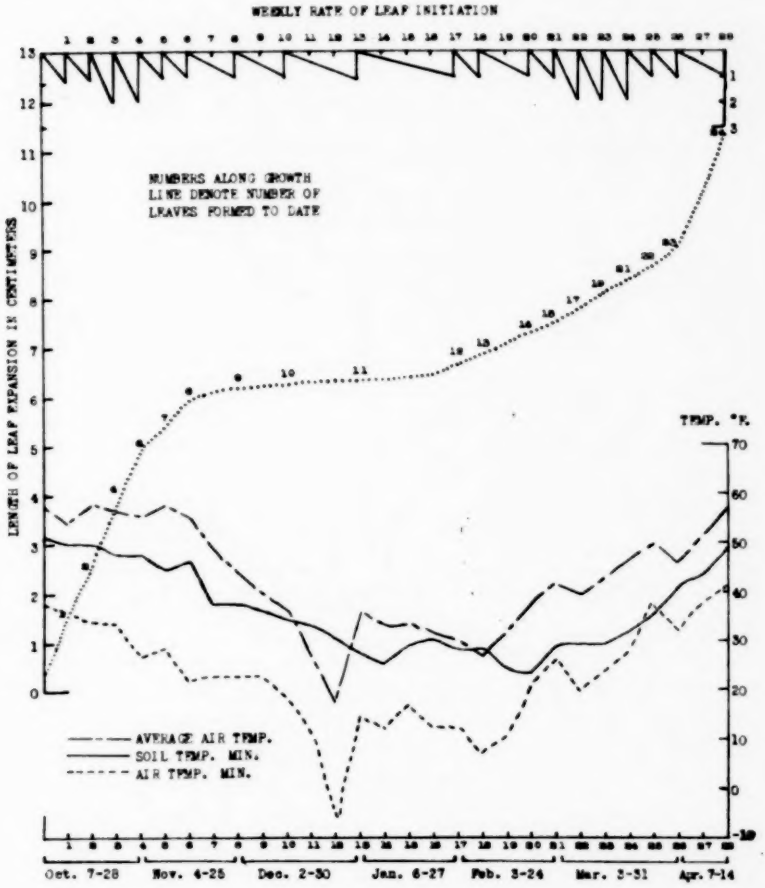


Figure 1. (a) First formed true leaves in 2 stages of development
(b) Intermediate leaf form between (a) and (c)
(c) Typical winter rosette leaf form

Winter Rosette of the Mature Plant. — First indication of the winter rosette form of the mature plant occurs during the latter part of September or, in some plants, in early October. Its initiation coincides with a drop in minimum air temperature to 40° F. and minimum soil temperature to 50° F. Although by this time most of the long shoots have died, it is not uncommon for individual plants to start the rosette while the cauline leaves are still green.

The rosette continues through the winter months and on until the first part of May, when the minimum soil temperature rises above 50° F. and the minimum air temperature rises above 40° F. Thereafter no new rosette leaves are formed and those present slowly wither, dying by the end of July. The typical leaf form is shown in figure 1c. The average weekly growth rate for the rosette leaf is shown in figure 2 along with the average weekly rate of leaf initiation. These are shown in relation to the minimum weekly soil and air temperature, and average air temperature. While initiation and elongation of rosette leaves are most rapid in fall and spring, the plants respond to

brief mild spells throughout the winter months. Rate of leaf formation and growth may be correlated with the temperature.



AVERAGE WEEKLY GROWTH RATE OF ROSETTE LEAF CORRELATED WITH WEEKLY MINIMUM TEMP. OF SOIL AND AIR + AVERAGE AIR TEMP.

Figure 2. Upper margin of graph shows the weekly rate of leaf initiation in the rosette. Upper right-hand margin shows number of leaves formed. For example, between the 13th and 17th weeks one leaf was formed, while during the 21st and 22nd weeks two leaves were formed. The central portion shows the average rate of rosette leaf elongation with numerals showing number of leaves formed up to any point. Rosette leaf formation and elongation ceased by the 28th week. Lower portion of graph expresses minimum soil and air temperatures and average air temperature.

The total number of leaves formed averages 25 through the winter rosette cycle, although by April the destruction by animals often reduces the number present by about 50%. The leaves, as they develop in the rosette, take a definite position in relation to each other (figure 3).

The growth rate of the winter rosette does not appear to be affected by the tree canopy. The start and highest growth rate occur in the fall when foliage intercepts about 98% of the light. In contrast

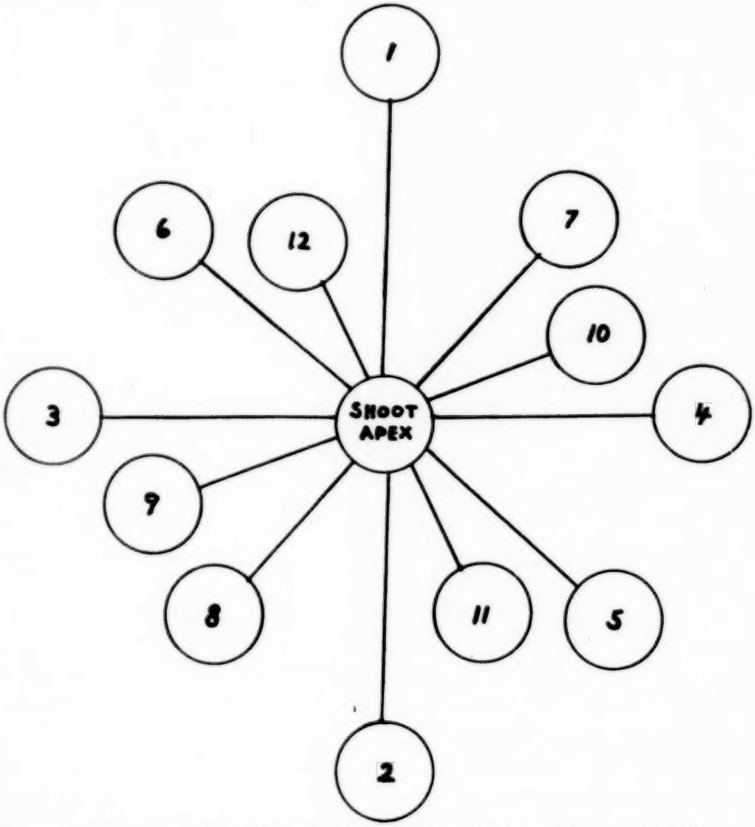


Figure 3. Diagram showing relative position of successive rosette leaves, based on field observations of 12 plants.

there is a final increase in growth rate in the spring before the tree canopy is closed over and while a high proportion of the light reaches ground level. The growth more nearly coincides with the temperature

than light intensity, for at both seasons of the year and under the contrasting light conditions the minimum soil and air temperatures are much the same.

Litter did not affect the growth rate of the winter rosette. Several plants were kept clear of cover while others were blanketed with from 1" to 3" of litter. In all cases the growth rate of the leaves and the rate of leaf initiation followed the same pattern (figure 2).

One further characteristic of the winter rosette was the production of anthocyanin, beginning when the air temperature dropped below freezing. Coloration started in the veins and along the leaf margins and gradually spread down through the petiole with an increasing color intensity as the temperature dropped lower and stayed below freezing. The anthocyanin did not disappear until after cessation of growth in the rosette (May 1).

Long Shoot. — Long shoot formation is initiated in the latter part of April when the maximum air temperature, during the daylight hours, begins to climb into the high 70's and the daylight period is much lengthened. It coincides with the cessation of rosette growth when the minimum air temperature rises above 40° F. and the minimum soil temperature above 50° F. The shoots averaged 2 per plant but there may be as many as 5. They are initiated at the same time or occasionally, as much as 1 week apart. The total number of leaves averages 8 to 14 on a mature plant. The first few leaves are pinnately compound and the upper leaves are simple. Flower buds are axillary. The ultimate degree of long shoot development appears to be related to the 2 environmental factors of light and temperature. Plants under full forest canopy averaged 40 cm. in height, with 3-4 fruit heads, while those in the forest opening averaged 90 cm. in height and had 40-60 fruit heads.

The growth rate of the plants in the open is greater than under full forest canopy. The parallel growth rate of the first 3 weeks before the canopy closes may be attributed to similar light and temperature. At this time the light intensity under the trees is 67% of that in the openings and the average temperatures of air and soil are equal. By the sixth week (the first week of June) the canopy is closed and the light is reduced to 6% of that in an open field. At this time plants in the openings start to outdistance those growing in the shade. The long shoots of the shaded plants stop elongating after 11 weeks of growth while those in the openings grow 2 more weeks or until about July 21. Temperatures of both soil and air, taken in early afternoon,

become quite different in open and shaded spots, the average temperature variation being 14° F. The pH of the soil (about pH 5) remained the same as during the winter. Moisture appeared to be adequate at all times, no wilting being observed in any of the plants.

Flower buds were first visible the last week of June and the first flower opened a week later in both the wooded and open area. Bud formation and flowering continued through the first week of August. Flowers in the open were about twice as large and several times as many as on shaded plants.

The maximum size of the fruit head was reached 3 weeks after flowering.

Although the life span of *Geum canadense* has not been determined, data available over a 2-year period on individual plants, show that the plants fruit at least 2 consecutive years.

Greenhouse Plants

Seed Germination. — About 3% of the green achenes planted in the greenhouse germinated; none of the brown did. Those were collected and planted the middle of October and germination occurred 2 months later as evidenced by the appearance of the first leaves. The seedlings developed into the winter rosette, but never initiated any long shoots.

Neither the dry nor the green achenes germinated after being subjected to a month of freezing temperature outdoors.

Effects of Winter Transplantings. — Plants brought into the greenhouse on November 12, 1950, which had been subjected to light fall frost, and also plants brought in on January 6, 1951, which had been subjected to a minimum air temperature of −6° F. and 2 weeks of frozen soil, continued to form rosette leaves at a weekly rate equaling that of normal fall growth. Those leaves which formed hugged the ground, as do those of plants in the field, and continued this way with no change for over a year. The number of rosette leaves formed exceeded by more than 10 times the number normally produced by field plants. Those with a reddish-purple tinge soon lost it when transplanted to the greenhouse.

The third group, brought into the greenhouse on March 12, 1951 after two additional months of freezing air and soil temperatures, responded quite differently. By mid April long shoots were initiated. The last of May the buds were forming and by the first week of June fruit was setting. Plants continued to flower and fruit through June and early July, thus completing this phase of their annual cycle 1 month ahead of the field plants.

VARIED PHOTOPERIODS. — Plants brought in in November and January and placed under light treatments for long and short-day periods continued their rosette formation exactly as plants not so treated.

The plants brought in in March produced long shoots and flowered at the same time under all 3 light periods. However, there were variations under the different photoperiods. All four plants under each photoperiod treatment showed consistently: (1) more

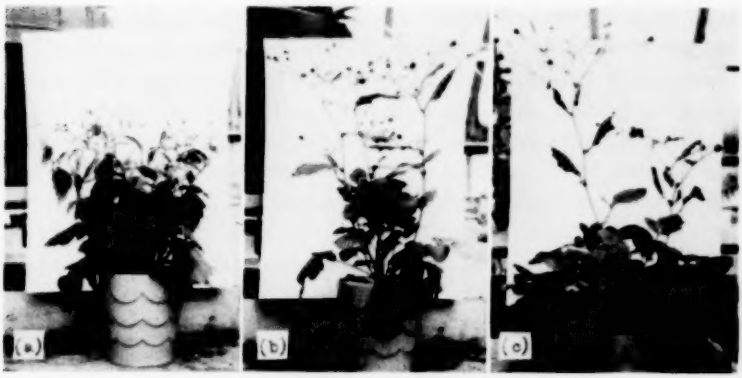


Figure 4. Maximum growth under the following photoperiod treatment:
(a) short day (8 hours)
(b) normal day (Seasonal daylength without modification)
(c) long day (17 hours)

long shoots were initiated and (2) more flower buds were formed under short-day conditions, but (3) the long shoots grew taller under long-day conditions (figure 4).

Due to methods used it was impossible to keep night temperatures exactly the same for all treatments. The average temperaure difference, in both maximum and minimum temperatures, between any of the treatments was 4°F. with extreme differences on 4 occasions as high as 8°F. The highest temperatures were reached with the short-day treatment.

NUTRIENT CULTURE. — Nutrient solution increased leaf initiation in the rosette fourfold, and leaves expanded to twice their ordinary size. The plants brought in in November and January formed 5 or 6 additional rosettes at the base during April. These continued to grow as rosettes through the summer and following winter in the greenhouse. The nutrient application also caused the normally prostrate rosette leaves to assume an upright position.

Discussion

Geum canadense is an herbaceous perennial (rosette-type hemicryptophyte) in which sexual reproduction occurs only toward the end of a period of vegetative development. This type of periodicity is common among summer blooming species, and characteristic of all herbaceous species which produce terminal inflorescenses on foliage-bearing stems (Meyer and Anderson, '39: 649).

The germination of seeds in *Geum canadense* is a fall phenomenon. Experiments (Nichols '34) with 3 other species of *Geum* show that germination is but little affected by freezing. *Geum peckii*, *G. rivale*, and *G. strictum* showed only sightly higher rates of germination after refrigeration. This is in contrast with *Geum canadense*, where refrigeration destroyed the vitality of the seeds. The scattered and sparsely developed colonies of this species in the woodlot may be a result of its poor adaptation for dissemination. The achenes must reach the ground while green, yet in this condition they adhere to the receptacle. The most effective means of dispersal is in the long, sharp persistent style together with an achene surface that readily adheres to such surfaces as animal fur.

The extent of development of the seedlings themselves throughout the winter months is dependent upon two main factors: (1) time of germination; and (2) location in respect to degree of shading. Unless germination occurs in late summer or early fall, there is little or no rosette formation until spring.

Although a low temperature is detrimental to germination, a freezing period is required to bring about flowering. The rosette begins to develop concurrently with a drop in both soil and air temperature. The growth rate throughout the rosette phase varies with the temperature and does not appear to be influenced by different light intensities. According to Garner and Allard ('23) the photoperiod is basically responsible for the change from flowering and fruiting to the winter rosette stage of growth. This study does not present any positive evidence as to whether the change-over to rosette form in *Geum canadense* is controlled by photoperiod or temperature change. Once the rosette is initiated, there is no photoperiod response.

During the growth of the rosette anthocyanin is conspicuous in the leaves. Intensity and extent of coloration varies from plant to plant. Meyer and Anderson ('39: 383) explain the formation of anthocyanin as an indirect result of the lowering of the temperature to freezing or below. Plants of *Geum canadense* which have become

reddish under field conditions soon lose the coloration when moved into the greenhouse. In the field with the rising temperature of spring the winter leaves gradually lose their anthocyanin but die before it is completely gone. The rosette, initiated at the time of lowered temperature in the fall finally ceases growth in mid spring when the air and soil temperatures rise.

Experiments by Rosendahl (14) in forcing native plants to blossom during the winter months showed that the stimulus of thorough freezing for several weeks is essential for flowering of many native perennials, including *Gem canadense*. He found that plants placed in the greenhouse without a freezing period did not flower. His results are in keeping with the findings of this study. He also found that the flowering time of *Geum canadense* was advanced approximately 3 months over plants in their natural habitat in Minnesota, while in the New Jersey study the advance in flowering was 1 month, a difference to be explained by either climate or ecotypes or a combination.

Long shoot development begins with a rise in temperature and coincides with cessation of growth of the rosette. The temperature at which the change occurs is about 50°F. average minimum for the soil, 40°F. average minimum air temperature and 50°F. average mean temperature. The growth rate of the long shoot is apparently controlled by both light and temperature. Although the species may be considered shade tolerant, it is favored by higher light intensities. Its uncommon occurrence in open fields may be due to inability to compete with open field plants.

Geum canadense flowers during a long photoperiod. However, plants have been found blooming the first week of September in New Jersey when the short-day plants had already begun to bloom. This supports the results of this study which indicate it to be a day-neutral type.

Summary

1. *Geum canadense* in New Jersey in its normal periodicity is a perennial with a winter rosette alternating with an upright flowering shoot in summer.
2. A definite cold (freezing period) is necessary during the winter rosette stage in order that the flowering stage may follow.
3. Seed has a short viable period. It must germinate soon after being shed, while the achene is still green. The seeds cannot stand a freezing period.

4. Variations in light and nutrients influence the growth and flowering of the plants but the primary control of periodicity appears to be temperature.
5. The present study has not discovered the factor controlling the cessation of the reproductive stage and initiation of the rosette stage although evidence points to a temperature factor being of prime importance.
6. Experimentation in photoperiodic response in the greenhouse places *Geum canadense* in the day-neutral or indeterminate plant group.

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The Lycosphens of Maryland, Delaware and the District of Columbia

Clyde F. Reed

Modern classifications of plants divide the vascular cryptogams into four classes: Psilopsida, Lycopsida, Sphenopsida and Pteropsida (in part). The second and third of these are often called the "lycosphens", the first not being represented in the floras of temperate regions except in laboratories and hot houses and the fourth being the true ferns and fern-like plants; also included in the Pteropsida are the flowering plants and the gymnosperms. Under older classifications the first three classes and that part of the Pteropsida including the ferns were placed under the Pteridophyta, chiefly because of similarities in their life-cycles. This paper deals with the Lycopsida (*Lycopodium*, *Selaginella* and *Isoetes*) and the Sphenopsida (*Equisetum*).

Except for a preliminary listing by counties of the Lycosphens by Reed (1943),* there have never been presented any distributional data for these plants in Maryland, Delaware and the District of Columbia. (The District of Columbia is included because it falls geologically on the mainland of Maryland, at least that portion east of the Potomac River. Also there is no natural boundary between Maryland and Delaware.) Essentially the area between the Mason-Dixon Line on the north and the Potomac River on the south constitutes the basis of this study — the Lycosphens of central eastern United States.

The distribution of each species, variety and form of Lycosphen appears on one of the accompanying maps. The marks indicate at least one collection, the specimen existing either in the Reed Herbarium or in one of the herbaria listed below. About 760 specimens are indicated on the maps. An annotated list of specimens is omitted as it would make this article too cumbersome.

Herbaria whose specimens are indicated on the maps.

1. Reed Herbarium, Baltimore 34, Maryland, including the Herbarium of Johns Hopkins University, the Herbarium of the Maryland Academy of Sciences, The C. C. Plitt Collection, the Geo. L. Smith Collection, the Botanic Club of Baltimore.
2. Herbarium of the University of Maryland, College Park.
3. Herbarium Dept. of Plant Industry, Beltsville.
4. United States National Herbarium, Herbarium of the District Flora.
5. Herbarium of the Natural History Society of Delaware, including the Tatnall Herbarium, Wilmington.
6. Herbarium of Academy of Natural Sciences of Philadelphia.
7. Goucher College, Towson.
8. Gray Herbarium, Harvard University, Cambridge, Mass.

Lycopsida

Three very different types of plants are included in the Lycopsida, and usually they are placed into three distinct orders, separated from each other by several groups of fossils. The Lycopsida constituted a major portion of the flora during the Carboniferous Period when

*Reed, Clyde F. County Distribution of the Ferns and Fern-allies in Maryland, Delaware and the District of Columbia. Bull. Natural Hist. Soc. Maryland 13: 47-54, map. 1943.

the coal-fields were being formed. Each of these three types of plants is represented in our region in Eastern North America by a single genus (although some hold that *Lycopodium* should be divided into several genera).

1. Plants usually terrestrial: leaves small but expanded, moss-like.
   2. Sporophyte homosporous ..... Lycopodiaceae
   2. Sporophyte heterosporous ..... Selaginellaceae
1. Plants usually aquatic in shallow water, infrequently semi-terrestrial: leaves quill-like ..... Isoetaceae

Lycopodiaceae

Lycopodium. This genus is found throughout Maryland and Delaware, many of the species widely distributed throughout the area, while others either have very limited distributions or just reach our area, especially in the mountainous region.

1. L. lucidulum Michx. Map 1. Shining Clubmoss. This clubmoss is frequently found on the Piedmont Plateau and only occasionally throughout the rest of the area except in the lower Coastal Plain where search for this species has been fruitless.

1a. L. porophilum Lloyd & Underw. Map 6(x). This little lycopod resembles *L. lucidulum* in stature, except that the branches are smaller in diameter, rarely branching above the level of the ground, and the leaves are broadest at the base and more pointed apically. Plants are easily confused with *L. Selago* and *L. lucidulum*, hence such synonyms as *L. lucidulum* var. *porophilum* and *L. Selago* var. *patens* (sensu Morton and others, not Fernald). The spore structure and presence of gemmae tend toward a relationship with *L. lucidulum*. This lycopod is rare in Maryland, thus extending its range from West Virginia (Gray's Manual, 8th Edition) eastward into western Maryland (Muddy Creek Falls, Garrett Co., *Reed* 29470, July 6, 1952).

2. L. inundatum L. Map 2. Bog Clubmoss. The plants in our region fall into three varieties, typical plants reaching us in western Maryland, known only in Garrett County (T), the other two being confined to the Coastal areas. The typical plants, known as the Northern Bog Clubmoss, are small, about four inches tall, and are confined to upland swampy areas. The other two varieties are larger and are difficult to separate in our region, varying from slender plants, known as the Slender Southern Bog Clubmoss (*L. inundatum* var. *Bigelovii*), to more robust plants, known as the Robust Southern Bog Clubmoss (*L. inundatum* var. *robustum*), this latter variety often be-

ing confused with the Fox-tail Clubmoss from which it may not be separable.

On the Coastal Plain of Maryland and Deleware specimens of the Southern Bog Clubmoss indicate two distinct regions of distribution, one just below the Fall Line, the other above the influence of the tidal rivers of the Chesapeake Bay on the Delmarva Peninsula, predominantly in Delaware and southeastern Maryland. Further search may help to explain the apparent distributional gap of these and other plants in Maryland and Delaware.

3. L. ALOPECUROIDES L. Map 3 (A). Fox-tail Clubmoss. This Clubmoss is found along the edge of the Coastal Plain in Delaware and southeastern Maryland in the same areas as the Robust Southern Bog Clubmoss.

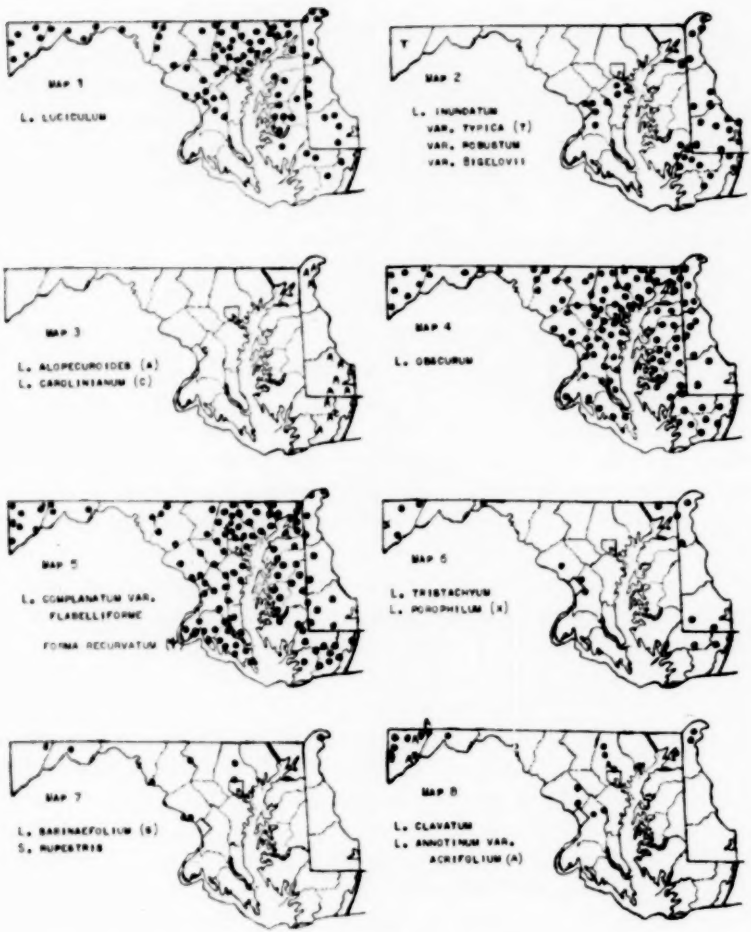
4. L. CAROLINIANUM L. Map 3 (C). Slender Clubmoss. The Slender Clubmoss is found on the Coastal Plain in sphagnous meadows and pinelands in Maryland. Known localities are near Washington, D.C. and then in Worcester County between the Pocomoke Swamp and the Atlantic Ocean.

5. L. OBSCURUM L. Map 4. Ground Pine. The Ground Pine is found throughout our region in moist woods and on shaded rocky slopes. Sometimes the Ground Pine is divided into two varieties, the more common Flat-branch Ground Pine and the very infrequent (in our region) Round-branch Ground Pine (Map 4 X). Again it is difficult to separate our specimens into these two distinct varieties.

6. L. COMPLANATUM var. FLABELLIFORME Fernald. Map 5. Trailing Evergreen, Running Pine. The Trailing Evergreen grows in damp and dry forests, in thickets and on open moist slopes, sometimes forming large patches in pinewoods on and above the Piedmont Plateau. There seem to be gaps in distribution of this species in the limestone regions of the Frederick Valley and the Hagerstown Valley, as well as along the halophytic regions of the Chesapeake Bay, the Delaware River and the Atlantic Ocean.

Sometimes a form with recurved branches and leaves is found in large patches in pinewoods (forma RECURVATUM Reed) on or above the Piedmont. (Map 5 X).

7. L. TRISTACHYUM Pursh. Map 6. Ground Cedar. This Clubmoss infrequently abides in sandy woods of the Coastal Plain and then in western Maryland in upland sandy woods. Compare the distribution of this species with that of *L. inundatum* and its varieties, *L. clavatum* and *L. annotinum* var. *acrifolium*. Several other plants



Maps showing distribution of *Lycopodium* in Maryland.

in Maryland and Delaware have this same distribution.

8. L. SABINAEFOLIUM Willd. Map 7 (s). Ground Fir. The Ground Fir is a rare lycopod in Maryland, being found in the upland meadows of Garrett County among hemlocks and magnolias in forests. Other lycopods found with this species near Fenzil were *L. clavatum*, *L. annotinum*, *L. complanatum* var. *flabelliforme*, and forma *recurvatum*, *L. tristachyum* and *L. obscurum*. Not far from this locality typical *L. inundatum* has been recorded. The 8th Edition of Gray's

Manual records the distribution of the Ground Fir as coming south only to Wayne County, Pennsylvania. This locality in Maryland extends the range considerably southwestward.

9. L. CLAVATUM L. Map 8. Running Clubmoss. The Running Clubmoss lives on exposed rocks, in mesophytic forests and in sandy ravines (on the Coastal Plain near the Fall Line) in our region. This species has a broken distribution in Maryland, being on the Piedmont and the adjacent Coastal Plain along the Fall Line and then on the Alleghany highlands in Garrett County.

10. L. ANNOTINUM var. ACRIFOLIUM Fernald Map 8 (X). Bristly Clubmoss. The Bristly Clubmoss is confined in Maryland to the mountainous uplands of Garrett County at the present time. However, it was found in the deep ravines of the drainage of the Gunpowder Falls before the Loch Raven Dam Reservoir flooded many of the localities along its course.

SELAGINELLACEAE

SELAGINELLA. Only two species of these plants grow in Maryland and Delaware, one confined to the rocky non-acid soils on and above the Piedmont, the other a small delicate species living in lawns and damp meadows, distributed widely in both states.

11. S. RUPESTRIS (L.) Spreng. Map 7. Rock Spikemoss. The Rock Spikemoss lives on exposed non-calcareous bluffs above the Fall Line, mainly on the Piedmont and westward to the Alleghany Mountains in Maryland. The Delaware locality no longer exists. Compare the distribution of this species with that of *L. complanatum* var. *flabelliforme*.

12. S. APODA (L.) Fernald. Map 9. Meadow Spikemoss. This species probably has a wider distribution than indicated on the map, since it is easily confused with the true mosses and is often overlooked for the same. It likes to live in lawns and wet meadows but does live around the edges of pools and springs in the Piedmont and Coastal regions.

ISOETACEAE

ISOETES. The Quillworts are a group of aquatic plants with a world wide distribution in fresh water, rivers, lakes, ponds and only rarely in saline waters. Only two species reach Maryland, although many more species have their southern limits of distribution in New Jersey, Pennsylvania and New York.

13. I. Engelmannii Braun. Map 10. Appalachian Quillwort. This Quillwort is amphibious in habit, living in sluggish streams, along the borders of pools and lakes in either shallow or deep fresh water in Maryland and Delaware. This species is more frequently found along the Fall line, but is infrequently found throughout both states.

14. I. riparia Engelm. ex A. Br. Map 11 (X). Coastal Quillwort. The Coastal Quillwort is found in tidal saline situations at the mouth of the Susquehanna River at the Chesapeake Bay. It has been found in like situations along the Delaware River, but is probably extinct there at the present time according to Tatnall and Proctor; cause—civilization.

15. I. riparia var. Palmeri forma saccharata (Engelm.) Proctor. Map 11. Chesapeake Quillwort. The Chesapeake Quillwort is the usual Quillwort found in the estuaries of the Chesapeake Bay drainage, being most common in very dilute saline to fresh water tidal conditions in Maryland and Delaware in the Coastal regions.

16. I. riparia var. reticulata (A. A. Eaton) Proctor. Map 11 (—). Potomac Quillwort. The Potomac Quillwort is one of the two southern-most varieties of the more northern Coastal Quillwort, being confined predominantly to the estuaries of the Potomac River below the Fall line and the lower western Chesapeake Bay.

Sphenopsida

Many groups of fossil plants belong to the Sphenopsida, most notable being the Calamites found in the coal-measures of western Maryland. The Equisetaceae, the Horsetails, represent the only living family of this group. They are characterized by the nearly leafless plants with pointed stems.

Equisetaceae

Equisetum. This genus is represented in our region by seven varieties or forms of four species of Horsetails. Two of the species, *E. arvense* and the varieties of *E. hyemale*, are found throughout both states, but the other two, *E. sylvaticum* var. and *E. fluviatile*, find their southern limit in northeast and north-central Maryland.

17. E. arvense L. Map 12. Field Horsetail. This is the most common of the Horsetails found in our region, living along railroads and along roadsides in sandy and clayey wet soils, along streams, in ditches and meadows, and in almost any wet waste space—practically ubiquitous. The species is quite variable in size and shape, with most

of the variations being due to the environmental factors. Many of these forms have been given names, but only one seems worthy of mention from our area.

18. E. ARVENSE forma PSEUDOSYLVATICUM (Milde) Luerss. Map 13. False Wood Horsetail. This form of the Field Horsetail resembles to some degree the Wood Horsetail in having the secondary branches again branched a third or fourth time. It is frequent in damp wooded habitats in semi-calcareous soils of the Piedmont, north of Baltimore, and in non-calcareous soils of the Coastal (St. Marys Co.) and Mountainous (Alleghany Co.) regions.

19. E. SYLVATICUM, represented in our region by var. PAUCIRAMOSUM milde forma MULTIRAMOSUM Fernald. Map 14 (x). Wood Horsetail. The Wood Horsetail which is one of our rare Horsetails reaches its southern limit in northeastern Maryland in Baltimore County.

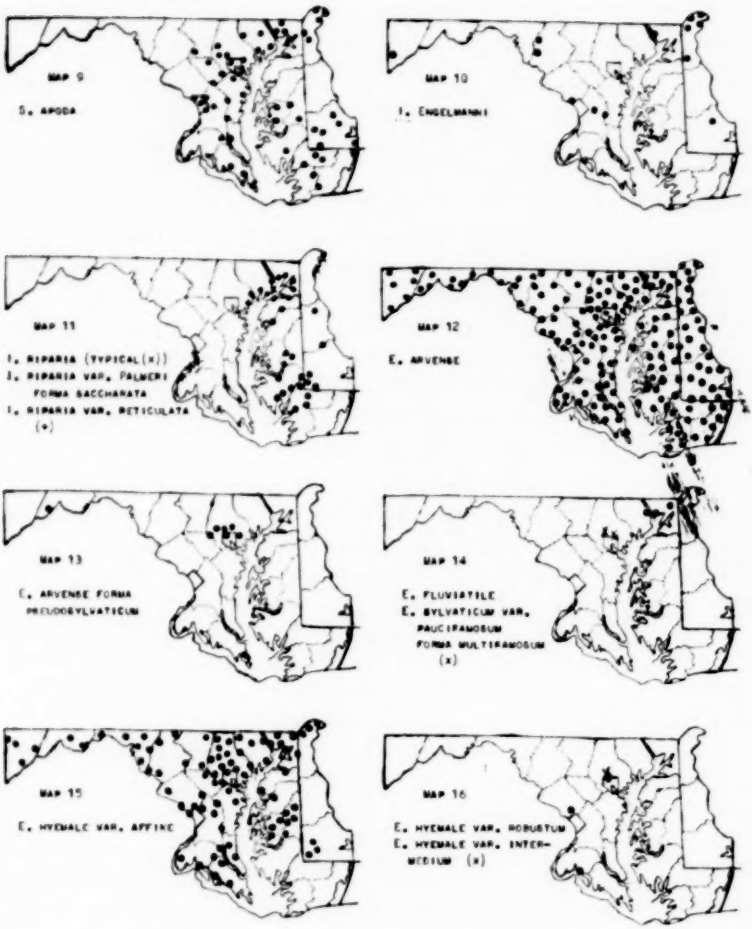
20. E. FLUVIATILE L. Map 14. Water or Swamp Horsetail. The Swamp Horsetail reaches into our region in northern Delaware and northeastern Maryland along the Susquehanna River at the edge of the Fall Line, just north of Havre de Grace and Aiken. It grows in swamps and around ponds, often growing in the water. It has invaded the old canal along the Harford side of the Susquehanna River between Havre de Grace and Lapidum.

E. HYEMALE L. Scouring Rush. The Scouring Rush is highly variable and the typical plant is Eurasian in distribution. Three varieties are recognizable in Maryland and Delaware.

21. E. HYEMALE var. AFFINE (Engelm.) A. A. Eaton. Map 15. American Scouring Rush. This variety of the Scouring Rush is the most common one in North America, and is found throughout the region west of the Chesapeake Bay and southward on the Coastal Plain to the central Eastern Shore. It grows in all sorts of wet places, but often forms large patches in alluvial soil along many rivers and streams in Maryland and Delaware.

22. E. HYEMALE var. ROBUSTUM (A. Br.) A. A. Eaton. Map 16. Tall Scouring Rush. This variety stands from three to five feet tall and is often branched in the second year's growth. It grows sporadically in muddy alluvial flats and along streams in our region, as at Rockland along Jones Falls.

23. E. HYEMALE var. INTERMEDIUM A. A. Eaton. Map 16 (X) Smooth Scouring Brush. Although this variety of the Scouring Rush is sometimes considered a separate species, the latest treatment recognizes it as a variation of the more widely distributed Scouring Rush.



Maps showing distribution of *Selaginella*, *Isoetes* and *Equisteum* in Maryland.

It reaches its southern limit in north-central Maryland in the drainage of the Gunpowder Falls in Baltimore County, as do several other plants, as the Wood Horsetail and the Swamp Horsetail.

Reed Herbarium
10105 Harford Rd.
Baltimore 34, Md.

NOTES and NEWS

TIARELLA IN HARFORD COUNTY, MARYLAND. — The Foam Flower, *Tiarella cordifolia* L., is a moderately thermophobic plant, ranging over regions of rather cool summer temperatures from the higher Appalachians up to southern Canada.

Recently Mr. Samuel Mason, Jr., an amateur botanist of Darlington, Maryland, discovered a small colony of this plant on his property, at 250 ft. altitude, in a fine tract of woodland where he has permitted no disturbance for many years — although unable to suppress the pernicious activities of Japanese Honeysuckle. He kindly guided me there on May 14, 1952, and the colony proved to comprise less than 100 plants, several of which had bloomed but none set seed this year. It is in cool moist subacid loam at the margin of a Skunk-cabbage swamp, where neutral water seeps out from among boulders of basic igneous rock. There is a fine colony of Giant Woodfern, *Dryopteris goldiana*, nearby, although curiously enough the commoner species of woodferns are absent. One taxon of more southern range was noted there, the Greenleaf Jack-in-the-pulpit, *Arisaema pusillum* (Peck) Nash (*A. triphyllum* of Fernald). On the other hand the decidedly thermophobic Northern Jack, *A. stewardsonii* Britton, grows but 5½ miles to the northwest at Cooper, altitude 275 ft., also in Harford County, Maryland.

There is geological evidence that during the Pleistocene the hills of the lower Susquehanna valley stood at considerably higher elevations above sea-level than they do at present, so that the summer temperatures were decidedly lower. At that time various plants of thermophobic tendencies may well have invaded the area. When the land sank and the sea rose to present levels, many of these died out, but a few managed to persist in local refuges, such as that here described.* — EDGAR T. WHERRY, UNIVERSITY OF PENNSYLVANIA.

*The exact locality is not here disclosed, to preclude vandalism. Should any wild flower digger contemplate a raid, Mr. Mason or the writer will be glad to present them with some roots of Foamflower obtained through commercial channels. Two small specimens have been pressed for filing in pertinent herbaria.

EUPATORIUM SESSILIFOLIUM F. INCISO-SERRATUM F. NOV. — It has been observed that the leaves of *Eupatorium sessilifolium* in various parts of Western Pennsylvania have a tendency to become deeply and sharply serrate, with ripsaw-like teeth, the cut on the front side of the tooth being up to as much as 4 mm. deep. Extreme examples may be designated as: *E. sessilifolium* f. **inciso-serratum**, f. nov., foliis inciso-serratis.

The specimen designated as the type was collected by O. E. Jennings, Aug. 7, 1913, at the base of a rocky, wooded slope facing Blacklegs Creek, about three miles north of Saltsburg, Pa. — O. E. JENNINGS, CARNEGIE MUSEUM, PITTSBURGH, PA.

NEW PLANT RECORDS FOR WEST VIRGINIA. — Several new state and county records appear among my recent collections in West Virginia. The following may be noted.

New State Records

ADIANTUM PEDATUM L. var. ALEUTICUM Rupr. Woods at Hayfield, Hampshire County. The 8th Edition of Grays Manual gives the southern limit of this variety in eastern North America as northern Vermont but my identification was verified by the late Mr. C. A. Weatherby.

BROMUS PURGANS L. forma GLABRIFLORUS Weig. White Sulphur Springs, Greenbrier County.

RANUNCULUS HISPIDUS Michx. var. FALSUS Fern. Dry woods. White Sulphur Springs, Greenbier County.

RHUS COPALLINA L. var. LATIFOLIA Engler. The variety is the form I have seen in West Virginia. Hampshire, Greenbrier, and Summers Counties.

VIOLA PENSYLVANICA Michx. var. LEIOCARPA (Fern. & Wieg.) Fern. Woods, White Sulphur Springs, Greenbrier County.

NYSSA SYLVATICA Marsh var CAROLINIANA (Poir.) Fern. Hanging Rock, Hampshire County.

OENOTHERA TETRAGONA Roth var. HYBRIDA (Michx.) Fern. Wet shale, Capon Springs, Hampshire County.

LYONIA LIGUSTRINA (L.) DC. var. CAPRAEFOLIA (Wats.) DC. Dry woods. Capon Springs, Hampshire County.

TEUCRIUM CANADENSE L. var. VIRGINICUM (L.) Eat. Dry woods. Capon Springs, Hampshire County. Ditch, White Sulphur Springs, Greenbrier County.

SCUTELLARIA NERVOSA Pursh var. CALVIFOLIA Fern. Woods, Ice Mountain, Hampshire County.

PYCNANTHEMUM TENUIFOLIUM Schrader. Woods, Lost River, Hardy County and Rupert, Greenbrier County.

PHYSALIS IXOCARPA Brotero. Field. White Sulphur Springs, Greenbrier County.

LOBELIA SPICATA Lam. var. SCAPOSA McVaugh. Dry woods, Capon Springs, Hampshire County.

SOLIDAGO ULIGINOSA Nutt. Woods, Capon Springs, Hampshire County. Wet Meadows, Cheat Bridge, Randolph County.

SOLIDAGO RUGOSA Ait. var. ASPERA (Ait.) Fern. Bog near Cold Spring Gap, Hampshire County.

SOLIDAGO CANADENSIS L. var. HARPERI Fern. Thicket by Howard Creek, White Sulphur Springs, Greenbrier County.

ANTENNARIA PARLINII Fern. var. ARNOGLOSSA (Greene) Fern. White Sulphur Springs, Greenbrier County.

HIERACEUM VENOSUM L. var. NUDICAULE (Michx.) Fern. Dry woods. White Sulphur Springs, Greenbrier County.

LACTUCA HIRSUTA Muhl. var. SANGUINEA (Bigel.) Fern. Wooded clearing, White Sulphur Springs, Greenbrier County.

SONCHUS ASPER (L.) Hill forma INERMIS (Bisch.) Beck. Cultivated ground, White Sulphur Springs, Greenbrier County.

EUPATORIUM SESSILIFOLIUM var. BRITTONIANUM Porter. Kate's Mountain, White Sulphur Springs, Greenbrier County.

New County Records

BROMUS DUDLEYI Fern. Woods, Capon Springs, Hampshire County.

BROMUS LATIGLUMIS (Scribn.) Hitchc. White Sulphur Springs, Greenbrier County.

PANICUM DEPAUPERATUM Muhl. var. PSILOPHYLLUM Fern. Dry woods, Capon Springs, Hampshire County.

HABENARIA PERAMOENA Gray. Monroe County. A few plants collected in a meadow near Gap Mills. Dr. Correll in his "Native Orchids of North America" records this also from Upshur County.

AQUILEGIA CANADENSIS L. var. COCCINEA (Small) Fern. Lost River, Hardy County. This seems to be more common than the species in this vicinity.

DELPHINIUM EXALTATUM Ait. In woods at base of limestone cliffs, Forks of Cacapon, Hampshire County.

CALLITRICHE DEFLEXA A. Br. var. AUSTINII (Engelm) Hegelm. Sandy wooded roadway, Capon Springs, Hampshire County.

Oenothera tetragona Roth var. latifolia (Rydb.) Fern. Pendleton and Greenbier Counties.

Sanicula marilandica L. Peters Mountain, Monroe County.

Zizia trifoliata. In woods at White Sulphur Springs, Greenbrier County.

Ligusticum canadense (L.) Britton. In cool woods on Ice Mountain, Hampshire County.

Rhododendron roseum (Loesel.) Rehd. Dry woods at White Sulphur Springs, Greenbrier County.

Gentiana quinquifolia L. Damp woods on Kate's Mountain, Greenbrier County.

Cuscuta rostrata Shuttlew. On Solidago in a meadow at Cheat Bridge, Randolph County.

Scutellaria ovata Hill var. rugosa (Wood) Fern. Kate's Mountain, Greenbrier County.

Pycnanthemum virginianum (L.) Durand & Jackson. White Sulphur Springs, Greenbrier County.

Pycnanthemum pycnanthemoides (Levenw.) Fern. var. viridifolium Fern. Dry woods, Brooks, Summers County.

Pycnanthemum muticum (Michx.) Pers. Sandy soil, Rupert, Greenbrier County.

Gerardia pedicularis L. Swamp, White Sulphur Springs, Greenbrier County.

Pedicularis lanceolata Michx. Swamp, White Sulphur Springs, Greenbrier County.

Campanula divaricata Michx. Dry ground, Shenandoah Mountain, Pendleton County.

Eupatorium sessilifolium L. var. vaseyi (Porter) Fern. & Griscom. Shale near sandstone, Summers County.

Solidago squarrosa Muhl. Gravelly woods, Great Cacapon, Morgan County.

Solidago Harrisii Steele. Woods, Kate's Mountain, Greenbrier County.

Cacalia Muhlenbergii (Sch-Bip.) Fern. Smoke Hole, Pendleton County.

Coreopsis major Walt. var. stellata (Nutt.) Robins. Dry woods, White Sulphur Springs, Greenbrier County. — F. W. Hunnewell, Wellesley, Mass.

DR. J. L. CARTLEDGE— Dr. Joseph Lincoln Cartledge, Professor of Genetics at West Virginia University and geneticist at the West Virginia Agricultural Experiment Station, died January 26, 1952, as a result of a heart attack, while attending a meeting of the Northeastern Corn Conference in New York City. He had just been elected chairman of the conference for the coming year.

Dr. Cartledge was born in Philadelphia, Pennsylvania, August 29, 1895. Following graduation from high school he entered the University of Pennsylvania. His college work was interrupted by World War I in which he served as sergeant in the 311th Field Artillery A.E.F. He returned to receive his A.B. and A.M. degrees from the University of Pennsylvania in 1918 and 1921, respectively. He served as Instructor in Botany in 1920-21 at the University of Pennsylvania. From there he went to the University of Pittsburgh where he served as Instructor and later as Assistant Professor of Botany from 1921 to 1933. While there he earned his Ph.D. degree. From 1933-36 he was Guest Investigator with the Carnegie Institution. In 1936 he accepted a position as Assistant Professor of Genetics as West Virginia University where he advanced to Professor in 1949. Most of his time was spent in teaching; in this field he was recognized as outstanding by students and faculty alike. He was interested in all students from beginners in the field of Genetics to graduate students. His sound advice and counsel were frequently sought by his colleagues. His fraternity, Pi Kappa Alpha, selected him as Chapter Adviser, in which position he was of untold help to the members.

In addition to his teaching he first assisted and then took charge hybrid corn breeding program in West Virginia. The progress made by this program is a tribute to his work in the field.

Outside of his college and research duties he found time to serve first as Secretary and later as President of the West Virginia chapter of Sigma Xi. He also served as President of the West Virginia University Faculty Club and was a member of various College and University committees.

He was a member of the A.A.A.S., Botanical Society of America, Society of American Naturalists, Genetics Society of America and the American Society of Agronomy, Phi Sigma, Phi Epsilon Phi, Sigma Xi and Alpha Zeta.—G. G. POHLMAN, WEST VIRGINIA UNIVERSITY.

BEN R. ROLLER.—The Rev. Ben R. Roller, a charter member of the Southern Appalachian Botanical Club, died in Charleston, W. Va., April 2, 1952. He was 71 years of age.

Although a native of Richmond, Va., he moved to Charleston in 1888 when his father became rector of St. John's Episcopal Church of that city. After graduating from Charleston High School he completed his education at West Virginia University, graduating in 1900. For a while he was a teller in the Citizen's Bank. In 1919 he was graduated from the Theological Seminary of Virginia and served as churches in Welch, White Sulphur Springs, and Rippon, W. Va.

Following his retirement in 1950, Mr. Roller, who was unmarried, resided in Weston and Charleston. He was a member of Beni Kedem Shrine and the York Rite Masonic bodies. He was a former secretary of the West Virginia Episcopal Diocese and an honorary member of the Rotary Club at White Sulphur Springs.

He was an enthusiastic amateur botanist and plant photographer, contributing important records of West Virginia plants. One of his articles, "Showy Lady's Slipper in West Virginia", was published in the very first issue of this journal, in January, 1936.

Book Reviews

KEYS TO LOCAL WOODY PLANTS. — Worth-while botanical publition falls commonly into two categories. One is, of course, the placing on record of the results of original research. The other is the presentation of botanical information in a form that is organized so as to be readily usable to those who have an interest in it, or of short-cuts to needed items. Its purpose is to save the person requiring specific information the labor of wading through enormous masses of literature searching for it. *Trees and shrubs in Eastern North America** by Benjamin Blackburn, while embodying the results of much original research on the characteristics of the plants treated, is outstandingly an example of the second category.

This book is a comprehensive series of keys, designed to enable the user to identify, down to species, and even to variety or form, any

*358 pp., Oxford University Press, New York, 1952.

"broad-leaved" woody plant growing wild or in cultivation outdoors in Eastern North America. Why the conifers are omitted, and how a key to "Plants with scale-like, needle-like, or linear leaves" can be included in keys to the "broad-leaved woody plants" are not really made clear. All teachers of courses in local floras or in systematic botany, as well as anyone interested in the plants growing around him, in this section of the country, will welcome and make wide use of this excellent volume.

After a clearly written but very brief set of instructions on how to use the book, there are 309 pages of keys and supplementary illustrative material. The keys could be used as a model for all future key-construction. They are strictly dichotomous, indented, and do not repeat, within a single key, the same pair of numbers for the headings. The typography is clear and the arrangement is eminently easy to follow. Most important of all, if instructions are followed, when identifying a plant one arrives at the right answer.

The arrangement is very logical. A preliminary key eliminates the few leafless genera and leads to the five keys to genera. Following these, the keys to species are arranged by genus, alphabetically. For each genus, common name and family are given, and for each species a common name and a brief statement of origin are given. The common names have been very well chosen, and the stupider practices of some of the recent common-name compendia have been fortunately avoided. Authors of botanical names are not included, a fact which somewhat lessens the usefulness of the book to professional botanists. A brief statement of occurrence or habitat would have been useful in facilitating identification and detecting mistakes by the users.

A short bibliography and a detailed index are provided, as well as a glossary of the technical terms used. The latter is apparently original, and is very well supplemented by one of the best features of the book. This is a well-labeled series of drawings of plants located in appropriate places among the keys, illustrating the more unfamiliar or potentially ambiguous terms used therein. In the glossary are page references to the appropriate drawings. Teachers who have attempted to explain such terms to beginning students will especially appreciate this feature.

Another outstanding advantage of the keys in this book is the successful avoidance, as primary distinctions, of characters which are likely to be lacking on the specimen in hand. Vegetative features are utilized wherever at all possible, and there are apparently no

places where entire dependence has been placed on flower or fruit. This is a major achievement where genera such as *Salix*, *Ribes*, *Rosa*, *Rhododendron*, and *Fraxinus* are included. This is a practice to be strongly recommended to future makers of keys. It greatly increases the labor and difficulty of constructing a key, but it saves immeasurably in time spent in using it.

Although this book is rather expensive ($6.00), it will unquestionably find a place in all college local flora and taxonomy courses in this section of the country and is a text that one would have no hesitation in urging even his impecunious students to own. — F. R. Fosberg, Pacific Vegetation Project, National Research Council, Washington, D. C.

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